ELEMENT MANAGEMENT SYSTEM AND METHOD UTILIZING PROVISION TEMPLATES

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention generally relates to network management techniques and, in particular, to an element management system and method utilizing provision templates for efficiently provisioning a plurality of network elements in a telecommunication network.

RELATED ART

A conventional communication network, for example, the public switched telephone network (PSTN), often employs a large number of communication network elements for signal processing and routing. For example, when a customer subscribes for digital subscriber line (DSL) service, a network provider connects a communication device of the customer to a DSL network element, such as a DSL card, via a DSL line extending from a field office of the communication network to the customer's premises. The DSL card typically includes circuitry for controlling various attributes (*e.g.*, line speed, error correction settings, *etc.*) of the DSL line.

Other customers also may subscribe for DSL services or other types of services offered by the network service provider. To provide such services, the network service provider may extend one or more communication connections from the premises of these

other customers to the same field office. Various other network elements (*e.g.*, DSL cards, IMA cards, ATMs, *etc.*) may be employed at the field office for controlling communication across these connections. Each of the aforementioned network elements is often positioned on one or more racks or chassis within the field office. Note that typical communication networks employ a large number of field offices similar to the one described above.

Before a network element can be utilized to control the communication over a line connected thereto, the network element must be provisioned. As used herein, the term "provision" refers to any process for setting or establishing control values for a network element. In this regard, a network element normally includes control values indicating how the network element should control the communication line and the communication occurring over the line. Such control values are normally stored in control registers or other types of memory on the network element. Moreover, these control values must be properly set in order to provide logic (*e.g.*, circuitry) residing on the network element with the necessary information for controlling the communication line in a desired manner. Note that after an initial provision, a network element can be re-provisioned in order to change the behavior of the network element and/or to accommodate for changes to the network in which the element operates.

As an example, the network element may store, in a control register, a line speed value indicating how fast the network element should communicate over the communication line. Logic on the network element is typically configured to utilize this value in order to control the line speed of the communication line. Note that the control values stored in the network element may be utilized to control various other attributes of

the communication line and of the communication occurring across the communication line.

The number of network elements employed by conventional communication networks can be quite large (*e.g.*, in the millions), and the process of provisioning the network elements can be quite tedious and burdensome. Indeed, in order to provision a network element in the past, a technician would travel to the element's field office. After locating the element to be provisioned, the technician would then plug a communication device into a communication interface capable of communicating with the network element and would download the desired control values into the network element. Such a technique for provisioning the network elements was very time consuming and expensive.

To facilitate management of network elements, element management systems (EMSs) have been developed that allow users to remotely manipulate the control values of selected network elements. An EMS includes a communication interface that allows the EMS to exchange data with many of the network elements employed within a communication network. To provision a particular network element, a user submits a request that identifies the particular network element and that includes the control values to be utilized to control the network element. The EMS then locates the particular network element and interfaces the submitted control values with the network element, which stores the control values to its control registers. In other words, the EMS locates and provisions the identified network element based on the information input by the user, who may be located at a location that is remote to the network element and/or the EMS.

Thus, the introduction of EMSs has greatly facilitated the process of provisioning network elements. However, the provisioning process can still be a burdensome task despite the introduction of EMSs. In this regard, at any given time, a network provider may need to provision a large number (*e.g.*, several thousands) of network elements. Submitting inputs for each of these network elements can be time consuming and tedious. Furthermore, a trained technician is usually required to submit the inputs for provisioning network elements, and employing such a trained technician to provision a large number of network elements can be quite expensive.

SUMMARY OF THE INVENTION

Generally, the present invention provides a system and method for managing elements of a communication network.

A system in accordance with one embodiment of the present invention utilizes memory and a system controller. The memory stores template data that is indicative of control values for controlling a network element. The system controller is configured to identify a plurality of network elements within the communication network based on user input and to automatically provision each of the identified network elements based on the template data.

The present invention can also be viewed as providing a method for managing elements of a communication network. The method can be broadly conceptualized by the following steps: receiving template data, the template data indicative of control values for controlling a network element; identifying a plurality of network elements within the

communication network based on user input; and automatically provisioning each of the identified network elements based on the template data.

Various features and advantages of the present invention will become apparent to one skilled in the art upon examination of the following detailed description, when read in conjunction with the accompanying drawings. It is intended that all such features and advantages be included herein within the scope of the present invention and protected by the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be better understood with reference to the following drawings. The elements of the drawings are not necessarily to scale relative to each other, emphasis instead being placed upon clearly illustrating the principles of the invention. Furthermore, like reference numerals designate corresponding parts throughout the several views.

FIG. 1 is a block diagram illustrating a conventional communication system.

FIG. 2 is a block diagram illustrating an element management system, in accordance with a preferred embodiment of the present invention, that may be utilized to monitor and/or control network elements depicted in **FIG. 1**.

FIG. 3 is a block diagram illustrating a more detailed view of the element management system depicted in **FIG. 2**.

FIG. 4 is a block diagram illustrating a more detailed view of a client depicted in **FIG. 2**.

FIG. 5 is a flow chart illustrating a preferred architecture and functionality of the element management system depicted in **FIG. 2**.

DETAILED DESCRIPTION OF THE INVENTION

The present invention generally pertains to an element management system (EMS) for the telecommunication industry. The EMS of the present invention enables network elements to be remotely and efficiently provisioned. The network elements reside in a communication network (*e.g.*, the public switched telephone network (PSTN), the Internet, *etc.*) and control various communication attributes of the network.

FIG. 1 depicts a conventional communication system **12**. As shown by **FIG. 1**, the system **12** includes a communication network **15** that is communicatively coupled to a plurality of communication devices **17**. The communication devices **17** may communicate to one another over the network **15** via techniques well known in the art. Each of the communication devices **17** is usually serviced by one or more network elements **21** residing within the network **15**. A first set **24** of network elements **21** resides within a first field office and services communication devices **17** located within a close proximity of the first field office. Furthermore, a second set **25** of network elements **21** resides within a second field office and services communication devices **17** located within a close proximity of the second field office. Note that other numbers of field offices, communication devices **17**, and network elements **21** are possible. Indeed, most conventional communication networks **15** employ millions of network elements **21** thereby enabling communication between millions of communication devices **17**.

In accordance with a preferred embodiment of the present invention, an EMS **28** is employed to enable efficient monitoring and controlling of the network elements **21**. As shown by **FIG. 2**, the EMS **28** is preferably coupled to one or more clients **31** that

may be located remotely from the EMS **28** and/or the network elements **21**. In the preferred embodiment, the EMS 28 stores various sets of graphical user interface (GUI) code **33** for displaying various GUIs to users of the client **31**. Network elements **21** of different types usually monitor and control different communication attributes, and each set of GUI code **33** defines a different GUI, which is usually specifically designed for a certain type of network element **21**. For example, a first GUI may be designed for a network element **21** of a first type (*e.g.*, a DSL card), and a second GUI may be designed for a network element **21** of another type (*e.g.*, an IMA card).

Moreover, when the user of a client **31** selects a particular network element **21** for monitoring and/or control, the EMS **28** downloads to the client **31** the set of GUI code **33** that defines a GUI corresponding to selected element's type. The client **31** then invokes the downloaded code **33** in order to display a GUI compatible with the selected network element **21**, and the user, via the displayed GUI, may submit commands for changing the configuration of the selected network element **21**, as will be described in more detail hereafter.

When a set of GUI code **33** is invoked, the invoked set of GUI code **33** not only may display a GUI, as described above, but may also, either periodically or on demand, transmit a status request to the EMS **28**. The status request identifies the network element **21** selected by the user of the client **31**, and in response to the status request, the EMS **28** gathers information pertaining to the status or operation of the selected network element **21**. In this regard, the EMS **28** is communicatively coupled to the selected network element **21** and reads the requested information from the selected network interface **21**. Communication between the EMS **28** and the network elements **21** is

preferably achieved via transmission control protocol/internet protocol (TCP/IP) and simple network management protocol (SNMP), although other protocols may be employed in other embodiments.

After reading the requested information, the EMS **28** transmits the requested information to the requesting client **31**. Note that communication between the EMS **28** and clients **31** is also preferably achieved via TCP/IP or some other suitable protocol. The set of GUI code **33** that originally submitted the status request displays the requested data via the GUI displayed by the invoked code **33**. Thus, the user of the client **31** is able to determine and monitor the status of the selected network element **21**.

At times, the user of the client **31** may desire to control the configuration of the selected network element **21**. For example, the user may desire to change the line speed of a communication line being serviced by the selected network element **21**. The GUI displayed to the user preferably allows the user to submit commands for changing the configuration of the selected network element **21**. When such a command is submitted, the GUI code **33** transmits the command to the EMS **28**, which then changes the configuration of the selected network element **21** in response to the command from the client **31**.

For example, in the case where the user desires to change the line speed of the selected network element **21**, the network element **21** may be configured to control its line speed based on a control value stored in a control register (not shown) residing within the network element **21**. In this example, the EMS **28** may be configured to overwrite the foregoing control value with a new value based on the command received from the client **31**. In other examples, other techniques may be employed by the EMS **28**

in servicing other types of configuration change commands received from the clients **31**. For more information pertaining to how the EMS **28** may be configured, refer to commonly assigned U.S. Patent Application, entitled "System and Method for Managing Elements of a Communication Network," (attorney docket no. 01-2122.02), and filed on February 6, 2002, which is incorporated herein by reference.

FIG. 3 depicts a more detailed view of the EMS **28** in accordance with the preferred embodiment. As shown by **FIG. 3**, the EMS **28** preferably includes a system controller **55** for controlling the operation and functionality of the EMS **55**. In this regard, the EMS **28** also includes a network element interface **57** and a client interface **59** that allow the EMS **28** to exchange data with the network elements **21** and the clients **31**, respectively. The system controller **55** may receive and service requests received from the client **31** via client interface **59**, and in servicing these requests, the system controller **55** may communicate with the network elements **21** via network element interface **57**.

Note that the system controller **55** can be implemented in software, hardware, or a combination thereof. In the preferred embodiment, as illustrated by way of example in **FIG. 3**, the system controller **55**, along with its associated methodology, is implemented in software and stored in memory **60** of the EMS **28**.

Also note that the system controller **55**, when implemented in software, can be stored and transported on any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch and execute instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport a program for use by or in connection with the instruction execution system, apparatus, or device. The computer

readable-medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a portable compact disc read-only memory (CDROM). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory. As an example, the system controller **55** may be magnetically stored and transported on a conventional portable computer diskette.

The preferred embodiment of the EMS **28** of **FIG. 3** further comprises one or more conventional processing elements **61**, such as a digital signal processor (DSP) or a central processing unit (CPU), that communicate to and drive the other elements within the EMS **28** via a local interface **63**, which can include one or more buses. Furthermore, an input device **65**, for example, a keyboard or a mouse, can be used to input data from a user of the EMS **28**, and an output device **67**, for example, a screen display or a printer, can be used to output data to the user.

FIG. 4 depicts a more detailed view of a client **31** in accordance with the preferred embodiment of the present invention. The client **31** depicted in **FIG. 4** includes a client controller **81** for controlling the operation and functionality of the client **31**, as described

herein. Note that the client controller **81** can be implemented in software, hardware, or a combination thereof. In the preferred embodiment, as illustrated by way of example in **FIG. 4**, the client controller **81**, along with its associated methodology, is implemented in software and stored in memory **84** of the client **31**. When the client controller **81** is implemented in software, it can be stored and transported on any computer-readable medium.

The preferred embodiment of the client **31** of **FIG. 4** further comprises one or more conventional processing elements **87**, such as a digital signal processor (DSP) or a central processing unit (CPU), that communicate to and drive the other elements within the client **31** via a local interface **89**, which can include one or more buses. Furthermore, an input device **93**, for example, a keyboard or a mouse, can be used to input data from a user of the client **31**, and an output device **96**, for example, a screen display or a printer, can be used to output data to the user.

In the preferred embodiment, the EMS **28** allows a plurality of network elements **21** to be provisioned quickly and efficiently. In this regard, the EMS **28** preferably allows a user to define or, in other words, initialize a provision template for provisioning a plurality of network elements **21**. The EMS **28** then utilizes the provision template to automatically provision the plurality of network elements **21**. A more detailed explanation of how the EMS **28** may be configured to enable such provisioning will now be described hereafter.

Template Initialization

Initially, a user of a client **31** causes the client **31 (FIG. 4)** to establish a communication session with the EMS **28 (FIG. 3).** Once such a session is established, the user may submit an input, via input device **93**, identifying a type of network element **21** for which a provision template is to be created. This may be accomplished by submitting an input identifying a particular one of the network elements **21**. The client controller **81** is configured to transmit the input to the EMS **28** via EMS interface **99**, and in response, the system controller **55** of the EMS **28** is preferably configured to retrieve a set of GUI code **33** defining a GUI compatible with the selected element **28** (*i.e.*, associated with the type of network element identified by the input). For example, if the input identifies a DSL card, the EMS **28** retrieves a set of GUI code **33** that defines a GUI for controlling the attributes of DSL cards. In another embodiment, the user may submit an input identifying a type of network element **21** rather than a particular one of the network elements **21**. In such an embodiment, the client **31** transmits the input to the EMS **28**, and in response, the system controller **55** of the EMS **28** retrieves the set of GUI code **33** associated with the identified type. For example, if the input identifies a network card type "DSL," the system controller **55** retrieves a set of GUI code **33** that defines a GUI for controlling the attributes of DSL cards.

After retrieving a set of GUI code **33**, as described above, the system controller **55** is designed to transmit the retrieved set of GUI code **33**,via the client interface **59**, to the aforementioned client **31**. The client controller **81** of this client **31** then invokes the GUI code **33** in order to display, via output device **96**, the GUI **101** defined by the received

GUI code **33**. The GUI **101** may include various graphical interfaces, such as icons, menus, and/or dialog boxes, for example, that enable a user to submit inputs for provisioning a network element **55** of the type that corresponds to the GUI **101**. More specifically, the GUI **101** enables the user to submit inputs defining the control values for a network element **55** of the type that corresponds to the GUI **101**. For example, if the GUI code **33** received by the client **31** defines a GUI **101** for controlling or monitoring DSL cards, then the user may utilize the GUI **101** for submitting inputs that define one or more control values for the DSL cards implemented in the communication network **15** **(FIG. 1)**.

If desired, the user may also provide inputs for instructing the EMS **28** to provision one or more network elements **21** based on the control values being defined by the user. Such inputs, if submitted, preferably identify each of the network elements **21** to be so provisioned.

After submitting the desired inputs, the user preferably provides a final input indicating that the user has finished manipulating or establishing the control values for the present template. In response, the client controller **81**, working in conjunction with the GUI code **33**, is configured to transmit data indicative of the user's inputs to the EMS **28**, via EMS interface **99**. The system controller **55** of the EMS **28** stores the data indicative of the established control values in memory **60** as a set of template data **110**. This set of template data **110** serves as a provision template for provisioning any number of network elements **21**. In this regard, as will be described in more detail below, the EMS **28** may utilize the set of template data **110** to automatically provision selected

network elements **21** based on the control values defined by the user during the aforedescribed template initialization.

Element Provisioning

Indeed, if the user selected one or more network elements **21** when initializing the template defined in the aforedescribed template initialization (*e.g.*, during the same communication session as the aforedescribed template initialization), then the EMS **28** may be configured to automatically provision these network elements **21** based on the foregoing set of template data **110** upon receipt of the set of template data **110** from the client **31**. In this regard, the system controller **55** preferably submits, to each of the selected network elements **21** via network element interface **57**, commands for causing each of the network elements **21** to replace its current set of control values with the control values defined by the set of template data **110**.

Furthermore, once the template data **110** has been defined and stored, a user may later instruct the EMS **28** to provision one or more network elements **21** in any future communication session with the EMS **21**. In this regard, after establishing another communication session between the EMS **28** and one of the clients **21**, a user may submit an input, via the client's input device **93**, requesting the EMS **28** to provision selected ones of the network elements **21** according to the previously initialized set of template data **110**. Note that the request preferably identifies each network element **21** to be provisioned (*i.e.*, each selected network element **21**) and preferably identifies the set of template data **110** to be utilized in the provisioning, if more than one set of template data **110** is stored by the EMS **28**.

The client controller **81** is configured to transmit the request to the EMS **28**, and the system controller **55** is configured to retrieve the identified set of template data **110** in response to the request. The system controller **55** then provisions each of the selected elements **21** based on the retrieved template data **110**. In this regard, the system controller **55** preferably submits, to each of the selected network elements **21** via network element interface **57**, commands for causing each of the network elements **21** to replace its current set of control values with the control values defined by the retrieved set of template data **110**.

Note that prior to provisioning the foregoing elements **21**, the system controller **55** may be configured to transmit the retrieved set of template data **110** to the requesting client **31.** The system controller **55** may also transmit GUI code **33** defining the GUI **101** associated with the retrieved set of template data **110**. In response, the client controller **81** causes the template data to be displayed via the output device **96** so that the user may analyze the control values defined by the template data **110** before the provisioning is performed. Such data **110** may be displayed within the GUI **101** defined by the received GUI code **33**.

Thus, the user may analyze the control values defined by the template data **110** and, if desired, change any of the control values defined by the data **110**. Once the user is ready for the selected network elements **21** to be provisioned based on the control values of the template data **110**, as changed by the user, the user submits an input instructing the EMS **28** to initiate provisioning. In response, the client controller **81** communicates the input to the EMS **28**, via EMS interface **99**. If the user changed any of the control values,

then the client controller **81** also transmits data indicative of such changes to the EMS **28** as well.

In response to the input received from the client **31**, the system controller **55** provisions the selected network elements **21** based on the identified set of template data **110**. However, if the user changed any of the control values of the identified data **110**, then the system manager **55**, based on the data received from the client **31**, updates the identified data **110** stored at the EMS **28** prior to provisioning. The system controller **55** then provisions each of the selected elements **21** based on the updated template data **110**. In this regard, the system controller **55** preferably submits, to each of the selected network elements **21** via network element interface **57**, commands for causing each of the network elements **21** to replace its current set of control values with the control values defined by the updated set of template data **110**.

By implementing the aforedescribed functionality, it is not necessary for a user to individually establish the control values for each of a plurality of network elements **21**. In this regard, if a plurality of the network elements **21** are to provisioned with the same control values, then a user can define or initialize a provision template indicative of the desired control values and then instruct the EMS **28** to automatically provision each of the plurality of network elements **21** based on the provision template without the user having to individually define the control values for each provisioned network element **21**. As a result, the process of provisioning a large number of network elements **21** can be greatly facilitated.

Furthermore, once a provision template has been defined by a trained technician, a person other than the trained technician may cause the EMS **28** to provision one or more

network elements **21** based on the provision template defined by the trained technician. For example, another person may be unaware of which control values should be used to properly provision a particular network element **21** (*e.g.*, a DSL card). However, if a trained technician has already defined a provision template for DSL cards that causes DSL cards to behave in a manner desirable to the other person, then the other person may simply instruct the EMS **28** to provision one or more network elements **21** based on the provision template defined by the trained technician. Thus, a user may cause the EMS **28** to provision one or more network elements **21** in a desired manner without actually knowing which control values cause the network elements **21** to behave in the desired manner.

OPERATION

The preferred use and operation of the EMS **28** and associated methodology are described hereafter.

To illustrate the operation of the preferred embodiment, assume that a network customer signs up for service with a particular network provider and that the customer requires a large number of network elements **21** of the same type (*e.g.*, DSL cards) provisioned with the same control values. To enable such provisioning in accordance with the preferred embodiment of the present invention, a user (*e.g.*, a trained technician) may utilize one of the clients **31** to establish a communication session between the EMS **28** and the one client **31**.

Utilizing the one client **31**, the user submits a request indicating that the user would like to manage or establish control values for a particular network element **21** or a

particular type of network element **21**. The request, referred to herein as a "managing request," is transmitted to the EMS **28**, which selects and retrieves a set of GUI code **33** corresponding to the selected network type (*i.e.*, the GUI code **33** defining a GUI that enables the user to establish control values for the selected network element **21** or for a network element **21** of the selected type), as shown by blocks **201** and **205** of **FIG. 5**. As depicted by block **208**, the EMS **28** then communicates the GUI code **33** retrieved in block **205** to the user's client **31**, which displays a GUI **101** defined by the foregoing code **33**.

The user then utilizes the GUI **101** to establish a particular set of control values that may be utilized to provision one or more of the network elements **21** in a desired way. Once the control values are established to the satisfaction of the user, the user submits an input causing the client **31** to communicate template data **110** that is indicative of the established control values to the EMS **28**. In response, the EMS **28** stores the template data **110** in memory **60**, as shown by blocks **211** and **214**.

Note that, during the same communication session, the user may also provide a request instructing the EMS **28** utilize the template data **110** to provision one or more network elements **21** identified by the request. As an example, the user may define a request that identifies each of the aforementioned network elements **21** that are of the same type and that are to be provisioned with the same control values. This request may be communicated to the EMS **28** along with the set of template data **110** or may be communicated at a different time (*e.g.*, along with the managing request received in block **201**). In the foregoing example, the EMS **28** automatically utilizes the received template

data **110** to provision each network element **21** identified by the request, as shown by blocks **216** and **219**.

At some later time, it may be desirable to provision one or more other network elements **21** via the same control values defined by the aforementioned set of template data **110**. For example, the aforementioned customer may request the network service provider to provide additional network elements **21** to satisfy the customer's increased communication needs. Furthermore, it may be desirable to change one or more of the control values of the template data **110** before provisioning the network elements **21**. For example, the additional network elements **21** may reside at a location where the line speed of the additional network elements **21** is preferably different than the line speed of the elements **21** previously provisioned.

In such an example, a user (*e.g.*, the trained technician or a different user) may establish another communication session with the EMS **28** via one of the clients **31**. The user may then submit a request for viewing the template data **110**. The client **31** communicates this request to the EMS **28**, which retrieves the template data **110** and communicates the template data **110** to the client **31** in response to the request, as shown by blocks **223, 225** and **228**. The EMS **28** may also provide the client **31** with GUI code **33** defining a GUI **101** for displaying the template data **110**.

Upon receiving the template data **110**, the client **31** displays the template data **110** to the user. The user may then submit one or more inputs for changing any of the control values. Once satisfied with the template data **110**, as changed by the user, the user submits one or more inputs that cause the client **31** to communicate the changed template data **110** to the EMS **28** along with a request instructing the EMS **28** to provision the

additional network elements **21** with the changed template data **110**. Note that such a request preferably identifies each of the additional network elements **21**.

In response, the EMS **28** stores, in memory **60**, the template data **110** received from the client **31**, as shown by blocks **232, 235** and **238**. Note that this stored set of template data **110** may either define a new set of template data **110** or may replace the set of template data **110** previously transmitted to the client **31** in block **228**. As shown by block **241**, the EMS **28** also provisions the network elements **21** identified by the foregoing request based on the template data **110** received along with the foregoing request. As a result, by implementing the aforementioned techniques, a large number of network elements **21** are efficiently provisioned.

Note that it is not necessary for the user to view the template data **110** prior to causing the EMS **28** to provision one or more network elements **21.** For example, once the first set of template data **110** (*i.e.*, the template data **110** received in block **211**) is established, the user may provision one or more network elements **21** in the same or in a different communication session without requesting to view the established template data **110**. In this regard, instead of submitting a request to view the established template data **110**, the user may simple submit a request to provision one or more network elements **21**. The request preferably identifies the one or more network elements **21** to be provisioned and, if necessary, the set of template data **110** to be used to perform the provisioning. However, the request preferably does not include template data **110**. In response to such a request, the EMS **28** retrieves the identified template data **110** from memory **60** and provisions the one or more network elements **21** utilizing the retrieved template data **110**, as shown by blocks **246** and **252**.

It should be noted that utilization of GUI code **33** as described hereinabove is not a necessary feature of the present invention. In this regard, GUIs generally facilitate the process of exchanging data with a user. However, it is possible to exchange data with a user without using a GUI defined by GUI code **33**. Moreover, it is possible for a user to provide the inputs described above without utilizing a GUI.

In addition, in embodiments where GUIs are utilized, it is possible to store the GUIs at locations other than the memory **60** of the EMS **28**. For example, the GUI code **33** defining the GUIs may be stored in each of the clients **31** or in a remote location accessible by the clients **31** and/or EMS **28**. Similarly, the template data **110** may be stored in locations other than the memory **60** of the EMS **28**. For example, if desired, the template data **110** may be stored at one or more of the clients **31** or at a remote location accessible by the clients **31** and/or the EMS **28**. However, storage of the GUI code **33** and the template data **110** at the EMS **28** provides an efficient methodology for providing each of the clients **31** with convenient access to the GUI code **33** and the template data **110**.